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An Empirical Study on the "Three Teachings" Reform of the New Generation Information Technology Curriculum in Higher Vocational Education

Shousen Chen[1,*], Quanzhu Jiang[2], Songyuchen Jiang[1], Mengxi Li[1]

[1]*Culture and Tourism School, Shandong Business Institute, Yantai, China*
[2]*Information Engineering School, Shandong Business Institute, Yantai, China*
[*]*Corresponding author*

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Abstract: In the process of talent training, vocational colleges must take in account the co-cultivation of professional ability and basic ability, and the information technology ability is one of the important factors of vocational basic ability. However, under the background of the rapid development of vocational college education concept and information technology, information technology ability training has hardly changed: the basic ability training mode in many schools is still based on office automation and word processing, lacking popularization and application of the new generation of information technology knowledge. Through empirical teaching research, this article puts forward a new mode of training of information technology ability, which is “data processing” centered instead of “technology application” centered. The article proposes concrete solutions for reform in the training process of "teacher, textbook and teaching method", providing references for education reform of new generation of information technology in vocational schools.

1. Introduction

With the development and application of artificial intelligence and other technologies, most jobs that are single, repetitive and do not need communication are gradually replaced by hardware and software robots. Vocational education is an education aimed at employment. Graduates' entrepreneurial ability and the ability to apply new generation information technology are keys to successful employment and career development. At present, vocational colleges generally regard the foundation of information technology as a basic course for various majors, offering information technology basic teaching mainly focused on office automation and word processing software. A survey of 1200 vocational college students from different schools and majors in Shandong Province found that in terms of electronic device usage, over 48% of students often come into contact or use electronic devices before entering university, but still 32% of students are not familiar with the basic composition of electronic devices (see Figure 1); In terms of using office software, nearly 20% of students are proficient in using office software such as WPS and OFFICE before starting school, completing corresponding tasks (see Figure 2), and 50% of students are able to use it simply, but feel

that they are not very proficient; However, in terms of the Internet of Things, cloud computing, Big data and other new generation information technologies, less than 20% of students have a slight understanding before going to college, and 80% of students lack understanding of the new generation of information technology knowledge.

The authors also conducted a survey on 140 teachers from different schools and professional vocational colleges in Shandong Province (see Figure 3), and found that less than 14% of teachers are satisfied with the current information technology basic teaching, while over 65% of teachers believe that further reforms are needed in the cultural foundation. For the reform direction, over 70% of teachers believe that it is best to combine learning with their profession.

A statistical analysis of 20 research literature on the innovation ability indicators of college students shows that 12 of them regard basic knowledge ability as an important indicator. In addition to professional knowledge, the most important component of basic knowledge is the foundation of information technology. However, the survey results indicate that, on the one hand, the cultivation of information technology basic abilities in vocational colleges is relatively lagging behind in terms of content and methods, and many schools still use teaching content and textbooks ten years ago, with little change in teaching methods; On the other hand, the popularization of the new generation of information technology is difficult, teaching methods are scarce, and the popularization of courses is not high. On the basis of practical exploration, this article discusses in detail the current teaching content and methods of the new generation of information technology courses in vocational colleges from the perspective of the "three education" reform. Innovative solutions are proposed in terms of content construction, teacher setup, teaching methods, and other aspects. Through empirical analysis[1], the results of the solutions are compared and studied, proving the effectiveness of the solutions.

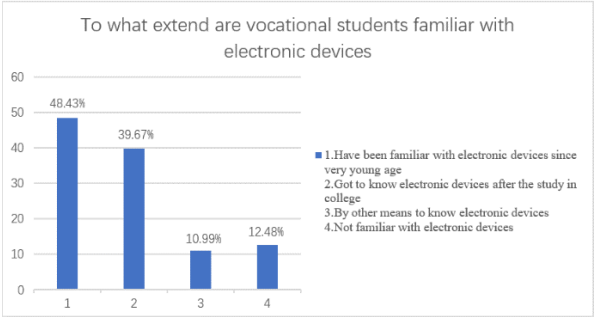

Figure 1: To what extend are vocational students familiar with electronic devices.

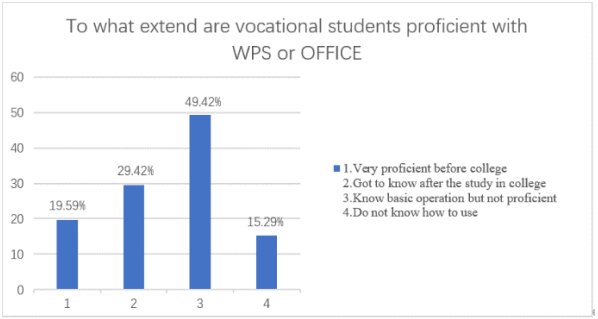

Figure 2: To what extend are vocational students proficient with WPS or OFFICE

The authors also conducted a survey on 140 teachers from different majors of various professional vocational colleges in Shandong Province (see Figure 3), and found that less than 14% of teachers are satisfied with the current information technology basic teaching, while over 65% of teachers believe that further reforms are needed in the cultural foundation. For the reform direction, over 70%

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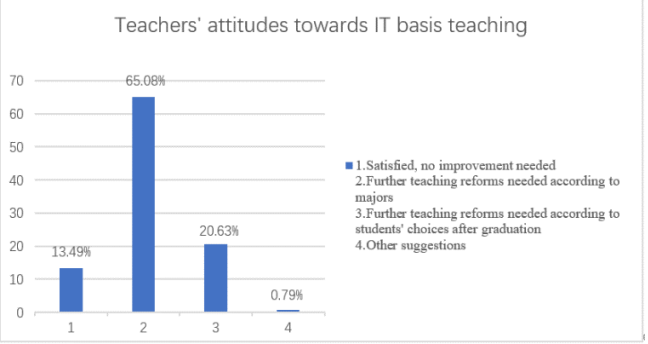

Figure 3: Teachers' attitudes towards IT basis teaching.

2. Current Situation Analysis

In order to organize the cultivation of basic information skills, in 2021, the Ministry of Education organized and developed of the "Curriculum Standards for Information Technology in Higher Vocational Education (2021 Edition)" (hereinafter referred to as the "Curriculum Standards"), providing guidance on the content and methods of information technology teaching. The document specifies that the basic teaching of information technology is divided into "Basic Module" with office automation as the main focus and "Expansion Module" with new generation information technology as the main focus. At the same time, it is suggested that the basic module should have 48 to 72 class hours, and the expansion module should have 32 to 80 class hours. Suggestions are also provided for the teaching content, curriculum outline, and teaching methods.

The course "Basic Module" (Fundamentals of Computer Culture) has undergone continuous reform and exploration. Currently, most vocational colleges adopt a task driven and practical approach, with the main training objectives including: familiarity with computer software and hardware; Proficient in using office automation software; Basic image, audio, and video processing capabilities; Basic website maintenance, APP software installation and usage capabilities, etc. In order to enhance students' interest and achieve good classroom results, various teaching modes such as flipped classroom and online offline combination are applied in most teaching processes. However, even though the curriculum continues to undergo teaching reforms, there are still many problems, such as some students being "underfed" and some teachers being dull in teaching content, resulting in many schools completely stopping basic information technology teaching.[2,3] In the teaching of the "Expansion Module" (new generation information technology), there are problems such as strong theoretical strength, high difficulty in knowledge, and shortage of teaching staff. Teaching is difficult, and the specific problems are summarized and analyzed as follows:

Problem 1: Insufficient class hours and outdated content

Vocational college students have limited learning time on campus, and the time spent on basic information technology courses is particularly tight. Most majors can only set 36 class hours, which is seriously insufficient. Due to various reasons, many schools still offer "Basic Modules" mainly based on WPS and OFFICE. Nearly 70% of students have already understood this part, resulting in poor classroom teaching effectiveness and low student interest. There are Difficulties in setting up content and controlling the proportion of "Basic Module" and "Extension Module", as well as inconsistent content before and after, and lack of systematic knowledge [4].

Problem 2: Lack of teaching staff

Non computer major teachers generally do not master the "Expansion Module", and most "senior teachers" in computer science are not familiar with it without long-term training. At the same time, the vast majority of teachers lack practical application experience, and their teaching content can only

focus on theory, which can easily lead to low student interest and poor classroom teaching effectiveness.[5]

Problem 3: Insufficient training resources

Unlike basic courses such as mathematics, English, and ideological and political education, the cultivation of information basic abilities requires students to operate by hands. Most schools can provide sufficient computer rooms for students to complete information technology basic training courses. However, the difficulty of teaching the "theory practical integration" of the "expansion module" is high, with few professional training rooms and insufficient training resources.[6,7] The vast majority of teachers (87.3%) hope that the new generation of information technology can be integrated with their majors in the teaching process, as shown in Figure 4. How to enhance students' interest and carry out integrated teaching of information technology and majors is an important issue currently facing vocational education.

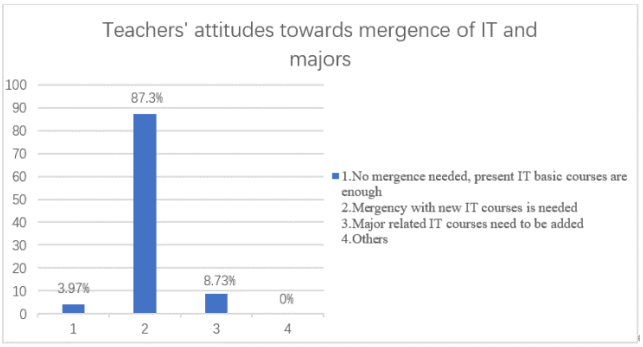

Figure 4: Teachers' attitudes towards mergence of IT and majors.

3. Solution

Based on the research results and the analysis of the problems, through discussions and exchanges with professional teachers from multiple schools, a specific teaching implementation solution for information literacy cultivation is proposed from the perspective of the "Three Teachings" Reform, as shown in Figure 5.

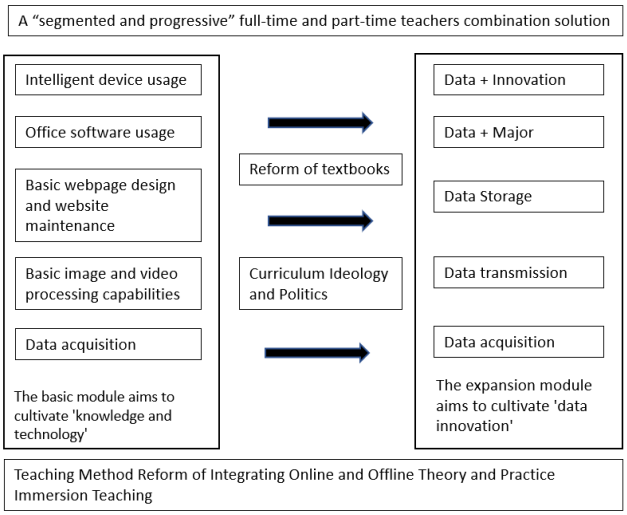

Figure 5: Solution for information ability cultivation.

3.1. Textbook: Transformation from "Knowledge Technology" to "Data Innovation"

According to the Curriculum Standards and the main modules of the new generation of information technology, the new textbook focuses on technologies such as the Internet of Things, 5G networks, cloud computing, big data, artificial intelligence, and blockchain, achieving a shift from cultivating "knowledge technology" abilities to cultivating data application and innovation abilities centered on" data acquisition - data transmission - data storage - data usage - data display ". And as vocational textbooks evolve, the following features are integrated into the textbook writing process:

Feature 1: Task driven and practice with projects

There are at least the following differences between vocational and undergraduate textbooks: firstly, the content selection for vocational textbooks are mainly based on hands-on experience; The second is that the theory doesn't need to be hard and deep, and there is less investigation into the causes and consequences; Thirdly, the language used in textbooks is simple and easy to understand, and the knowledge is elaborated on through case studies and readily available phenomena.[8] Therefore, in the process of writing new generation information technology textbooks, it is necessary to consider setting appropriate tasks and breaking them down into specific achievable steps to facilitate students' hands-on operation. And fully consider the construction foundation of vocational colleges' training rooms, with task design mainly achieved through mobile phones. Set up 3-5 projects appropriately to guide capable students to participate in specific projects and cultivate innovation and entrepreneurship abilities.

Feature 2: New form

The development and popularization of mobile information technology have promoted the transformation of ordinary textbooks into new forms of textbooks. Currently, a new form of textbook construction model with paper textbooks as the core and supporting resources as auxiliary has been formed.[9] First, the teaching syllabus, courseware, teaching plan, teaching plan and other contents of the teaching materials are provided in the form of QR code through the official account, website, publishing platform, which not only facilitates teaching but also promotes teachers' discussion and exchange; The second is to provide teaching videos, operation steps, and animations to explain the content that is difficult to express in text; Thirdly, some of the content provides an online training system or environment, allowing users to complete projects directly through online platforms.

Feature 3: School enterprise cooperation, online and offline loose leaf textbooks

In order to promote more effective vocational education textbooks, the state encourages the joint development of textbook content by schools and enterprises. The content organization method is expressed through work order or loose leaf format, that is, through project initiation, project implementation, project evaluation and other processes to complete content organization and knowledge embodiment. However, in reality, the high cost, difficult binding, and inconvenient transportation of loose leaf textbooks hinder their application. By combining electronic and physical loose-leaf materials, the cost of binding, printing, and transportation of loose-leaf textbooks can be greatly reduced, achieving the functions of loose-leaf textbooks, and promoting the promotion and application of loose-leaf textbooks.[10]

3.2. Teaching Method: Reform from "Theoretical Popularization" to "Immersive Experience"

The reform of information technology basic teaching covers a wide range and involves a deep degree. Not only does the content need to be updated in a timely manner, but also the teaching methods and supporting practical training need to be changed accordingly.

According to the survey data in Figure 1 and Figure 2, about 20% of the students still know nothing about basic information technology, and about 50% of the students need to meet the requirements of Basic Modules in the Curriculum Standards through training. To solve this problem, admission tests,

online self-study, and task training can generally be used to encourage some students who are not proficient in basic information knowledge, cannot proficiently use intelligent devices, or are not proficient in office automation software and hardware to meet the ability requirements of the "Basic Module" in the "Curriculum Standards" through practice.

The 'Expansion Module' adopts a centralized teaching and unified teaching mode for learning. For schools with better conditions, it is possible to consider introducing teaching platforms and supporting relevant training equipment. However, the new generation information technology involved in the "Expansion Module" involves a lot of content. If all the training rooms are built to serve the entire school, it will bring a huge burden to the school and also cause resource waste. First, develop mobile device related training projects, such as Wechat official accounts, channel accounts and mini programs; Secondly, on this basis, add some cost-effective and widely popular devices, such as VR glasses, and purchase corresponding resources to enrich simulation resources, promoting students to quickly understand principles and definitions, and experience the convenience brought by the new generation of information technology.

3.3. Teacher: Transitioning from "Throughout the Term" to "Progressive Segmentation"

The shortage of teachers is one of the important reasons hindering the daily teaching of the "Expansion Module" in vocational colleges. Many schools try to solve the problem of teacher shortage by introducing new teachers, training old teachers, and hiring part-time teachers. However, the new generation of information technology covers a wide range of knowledge, from the Internet of Things, cloud computing to artificial intelligence, big data, blockchain, etc. Although data is at the core, it is very difficult for teachers to become experts in every field and be able to demonstrate teaching to students.[11] Therefore, in addition to the conventional mode mentioned above, it is recommended that schools adopt a segmented modular teaching mode for the curriculum, where one teacher is responsible for one module of teaching tasks, breaking the traditional mode of one teacher running from the beginning to the end, and adopting multiple teacher segmented modes, paying attention to the correlation between each module, thus solving the problem of teacher shortage throughout the entire curriculum.

By all these means, in the basic teaching of information technology, the teaching content has shifted towards "data innovation", and the teaching methods have achieved a combination of online and offline "immersive experience". The "segmented and progressive" teaching mode has solved the shortage of teachers, which can effectively promote the implementation of the Ministry of Education's "Curriculum Standards", promote the reform and upgrading of the new generation of information technology teaching, and meet the career development needs of vocational students from different sources and majors.

4. Curriculum Thought and Politics

Talent cultivation first needs to solve the fundamental problem of "who to cultivate, how to cultivate, and for whom to cultivate". Whether it is the new generation of information technology or basic information technology, on the one hand, most technologies, concepts, and definitions originate from Europe and America, and their ways of thinking and solving problems are inevitably included in the content; On the other hand, the current mainstream software and hardware, from chips to operating systems and application software, do not have obvious domestic advantages in many fields.[12] Therefore, Talent cultivation first needs to solve the fundamental problem of "who to cultivate, how to cultivate people, and for whom to cultivate people". Whether it is the new generation of information technology or basic information technology, on the one hand, most technologies, concepts, and definitions originate from Europe and America, and their ways of thinking and solving

problems are inevitably included in the content; On the other hand, the current mainstream software and hardware, from chips to operating systems and application software, do not have obvious domestic advantages in many fields. Therefore, Curriculum thought and Politics is particularly important in the teaching process. After practical teaching exploration, at least the following three aspects of the Curriculum thought and Politics should be closely integrated during the teaching.

Element 1: Cultivate patriotism

Although foreign countries have certain advantages in the field of technology, the Chinese nation has a long history and has created excellent culture and technology in the long river of human history. As a young college student in the new China era, we should have a clear understanding of information technology and learn to use it to contribute to the country's strength and national rejuvenation. Through course learning, patriotism can be put into practice: that is, through one's own efforts, to eliminate backward areas in society and contribute to economic growth.

Element 2: Cultivate entrepreneurial spirit

Entrepreneurial spirit does not require every college student to start a business or become an entrepreneur, but encourages college students to have a sense of responsibility and hard work in their daily lives like entrepreneurs. They are not afraid of difficulties and have the courage to strive for success in their work, and they are not afraid of competition and have the courage to climb new heights in the workplace. Entrepreneurial spirit is also one of the foundations of innovation education, which can provide a continuous driving force for innovation and encourage college students to dare to try and innovate.

Element 3: Promoting the spirit of craftsmanship

Only rigorous and meticulous information technology projects can achieve success. Through teaching methods such as project leadership and task driven, allowing students to do things themselves can help cultivate their craftsmanship spirit. At the same time, most information technology projects are exploratory and innovative, and students will have new experiences and understanding of research methods, techniques, paths, and tools while completing the projects.[13] No matter what profession students will engage in in in the future, their professional ethics, professional quality, and professional abilities will be improved through course learning.

The effective integration of ideological and political elements in the curriculum has provided a strong guarantee for the teaching reform of information technology basic courses, and achieved the overall improvement of course quality. The course not only enhances the basic professional abilities of students on campus, but also better answers the question of "who to cultivate, how to cultivate, and for whom to cultivate", transmitting positive social energy.

5. Practical Testing of Teaching Effect

Since the promulgation of the Curriculum Standards, teaching pilot reforms have been carried out in authors' school in accordance with the aforementioned teaching reforms. Two parallel classes of 48 students in the tourism management major were selected, with 24 students in each class. One class offered the course "New Generation Information Technology Fundamentals" as a major basic course, while the other class did not offer related courses. After the course study, we used the indicator system and evaluation method from Cao Yingyi's "Research on the Construction of the Index System for Innovative Ability of College Students" to observe four first level indicators and 17 second level indicators, results as shown in Table 1.

An evaluation group consisting of 5 college leaders, counselors, and full-time teachers was established to score 48 students (rounded). The scores of the two classes are shown in Table 2 (Class 1 is the experimental class, and Class 2 is the control class).

Table 1: Observation indicators of innovation system.

First Level Indicator	Second Level Indicator
Innovative Learning Ability	Ability to discover problems, search for information, update knowledge, and innovate
Fundamentals of Innovative Knowledge	Basic knowledge level, professional knowledge level, cross knowledge level, innovative knowledge level
Creative Thinking	Intuitive thinking ability, logical thinking ability, innovative imagination ability, critical thinking ability, and inspiration thinking ability
Innovative Skills	Innovation activity achievements, unique level of research topics, quality of course design, and quality of graduation thesis

Here the z-test with a α value of 0.05 was used to analyze the scoring results of two classes, and P (Z<=z) was significantly smaller than the double tailed test α Therefore, there is a significant difference in innovation ability between these two groups of students, and it can be seen that innovation ability has significantly improved. The specific test analysis results are shown in Table 3. Through empirical testing, it has been shown that the teaching of new generation information technology can effectively enhance the foundation of innovative knowledge and innovative thinking, thereby achieving the improvement of innovation ability. Innovation ability is one of the core competencies among students' comprehensive abilities, which indirectly proves the improvement of students' comprehensive abilities.

Table 2: Evaluation scores of experimental and control classes.

Student No.	1	2	3	4	5	6	7	8
Class 1	87	82	85	87	86	75	92	77
Class 2	85	75	89	76	80	81	78	84
Student No.	9	10	11	12	13	14	15	16
Class 1	85	83	70	75	79	81	83	83
Class 2	77	79	80	85	76	73	75	78
Student No.	17	18	19	20	21	22	23	24
Class 1	84	78	89	90	86	83	84	87
Class 2	80	83	78	81	85	76	88	79

Table 3: use Z-test result with α value of 0.05.

Z-test: double sample average analysis		
	Class 1	Class 2
Average	82.95833	80.04167
Known covariance	27	18.13
Observed value	24	24
Assuming average mean	0	
z	2.126962	
P(Z<=z) one tail	0.016712	
z one-tailed critical region	1.644854	
P(Z<=z) Double tail	0.033423	
z Double tailed criticality	1.959964	

6. Conclusion

The reform of information technology basic teaching for all students in vocational colleges needs to constantly change to adapt to the continuous updating and development of information technology and vocational education concepts. This article mainly discusses a series of feasible reform plans

from the perspective of teaching content, methods, and teacher i.e. "Three Teachings" Reform, and verifies them in the actual teaching process. The fact proves that this plan is indeed feasible and effective, and can effectively promote information technology teaching reform, enhance the innovation ability of students in vocational colleges, and thus enhance their comprehensive abilities.

By promoting the teaching reform method in this article, results can be achieved at least the following aspects: firstly, it has solved the dilemma of information technology basic teaching for students of different origins, saved about 20% of teachers for information technology basic teaching, and effectively improved the actual teaching effect. The saved teachers have been improved in different fields through rotation training, and can better support teaching reform. Second, students were strongly supported to participate in the National College Students Internet plus Entrepreneurship Competition and the "Challenge Cup" College Students Series Science and Technology Competition. One of the characteristics of these events is that students are required to achieve innovation and entrepreneurship through the organic combination of new generation information technology and majors. The third is to broaden the employment channels for graduates and increase more employment opportunities. With the development of information technology, some regulated, standardized, and low interaction jobs are gradually being replaced by artificial intelligence, while people mainly engage in innovative and pioneering work. The new generation of information technology and innovation are playing an increasingly important role in student employment. With the continuous implementation of the "Curriculum Standards", there are still many problems in the practical training and examination forms of the curriculum, as well as the connection between the curriculum and the second level as well as the junior college-to-undergraduate level. Further research and exploration are needed.

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